United States
Department of
Agriculture

Forest Service

Fire Management Notes

Spring 1981
Volume 42, No. 2

Fire Management Notes

An international quarterly periodical devoted to forest fire management

United States
Department of
Agriculture
Forest Service

Spring 1981
Volume 42, No. 2

Contents

Fire Management Notes is published by the Forest Service of the United States Department of Agriculture, Washington, D.C. The Secretary of Agriculture has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through September 30, 1984.

Subscriptions may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The subscription rate is $5.00 per year domestic or $6.25 per year foreign. Single copy cost is $1.25 domestic and $1.60 foreign.

Send suggestions and articles to Chief, Forest Service (Attn: Fire Management Notes), P.O. Box 2417, U.S. Department of Agriculture, Washington, D.C.20013.

John R. Block, Secretary
U.S. Department of Agriculture

R. Max Peterson, Chief
Forest Service

L.A. Amicarella, Director
Cooperative Fire Protection

Francis R. Russ,
General Manager

Change of Address

Please notify us when you move so that Fire Management Notes may follow you. Please send the mailing label along with your new address. ■

The Cover: Young San Bernardino County residents study a map that shows where fireworks can legally be used and, is part of a cooperative Fourth of July safety program described in our lead story.

San Bernardino Interface: Fourth of July Fireworks Safety Program

Charles Coval and D. V. Schilling

Fire prevention officer, San Bernardino National Forest, USDA Forest Service, San Bernardino, Calif.; Computer Specialist, Forest Fire Laboratory, Pacific Southwest Forest Experiment Station, USDA Forest Service, Riverside Calif.

In 1979, the Pacific Southwest Forest and Range Experiment Station started the San Bernardino Interface Project to stimulate a cooperative prevention effort. The project involves a test area of 110,000 acres through the Cajon Pass, which is protected from fire by four agencies: The California Department of Forestry, the county of San Bernardino, the San Bernardino National Forest, and the city of San Bernardino. For the first 3 years of the program, the Pacific Southwest Station assembled a data base covering the fire history of the area. In the spring of 1980, the Station joined with the four agencies in developing one of the first truly cooperative prevention programs—a Fourth of July Fireworks Safety Program.

The Information Package

One phase of the prevention effort was to make the users of fireworks aware of legal and illegal areas for fireworks discharge. Fireworks are prohibited in San Bernardino County and on the San Bernardino National Forest. The city of San Bernardino, however, allows sale and use of "safe and sane" fireworks within certain sections of the city. The city fire department provides a map describing these sections with each fireworks sale. The interface working team decided to develop a package of information incorporating an improved map, and to finance copies for distribution by booths that sell fireworks in the study area. The idea was to try to limit discharge of fireworks to legal areas because larger and more destructive fires tend to occur in illegal areas.

The new map was based on the 1979 map, the technical description of legal and illegal areas designated by the city ordinance, and a San Bernardino County road map. The new map uses a positive appraoch—defining legal areas, rather than the forbidden areas.

The maps were backed in the information package by a prevention message adapted from the California Department of Forestry's Five-Point Team Teaching Packet, and a parks list. The list of parks was included to encourage potential fireworks users to use the open green areas of 2 acres or more found in the parks.

The Prevention Show

Another phase of the prevention program sought to inform adults and children of safe methods of handling fireworks. Assuming that adults, with children in tow, purchase fireworks, we designed a display for use near selling booths. The display was developed so that it could be moved easily by trailer.

For the prevention show, messages were borrowed from each agency's historic prevention programs. The Forest Service's Smokey Bear and wildland setting reinforced the "wildland is good" theme. The urban "Sparky Dog" attracted city

Figure 1.— *Smokey Bear display and closed circuit television inside fire prevention trailer.*

dwellers' attention, and a video-tape from the California Department of Forestry's Five-Point Team Teaching Packet presented visual, fireworks-specific prevention information (fig. 1). Prevention handouts and the legal area map were available, as were helium-filled Smokey Bear balloons and Smokey Bear badges for all who attended the program.

The trailer, outfitted by the cooperating agencies made its debut in an area shopping mall the weekend before the start of fireworks sales (fig. 2). Midweek the following week, the show appeared at a second area mall. Once fireworks sales began, the trailer was parked beside different selling booths.

Some technical difficulties arose when the trailer's generator noise overpowered conversation and caused color distortion on the video player. Original operating hours were scheduled from noon to 8:00 p.m. But as the campaign progressed, the hours decreased because of noise and the fact that fewer contacts were being made beside the booths than had been made at the malls. Also, though each agency provided one person each day to staff the trailer, further volunteers were not available as we had hoped they would be. Next year we may have more help since one fire-conscious group has decided not to sell fireworks next year, and some of their members may be available to help in the prevention program.

Figure 2.— *Visitors gather at fire prevention trailer in local shopping mall.*

Other Prevention Efforts

Along with the map and contact campaign, several other prevention efforts were made. The electronic signs at the Central City Shopping Mall and the Ontario Motor Speedway flashed prevention messages associated with fireworks. The Goodyear Blimp flew a prevention sign over Los Angeles, and the local paper carried two articles on the project.

This Year's Campaign

This year we will emphasize reducing the flow of unapproved fireworks into the area. We will focus on this problem because we have become aware of increased use of these dangerous fireworks and increased fire starts from their use. The cooperative team is sponsoring a 1-day workshop in April aimed at increasing recognition of the problem and expanding the area of cooperation.■

The Mack Lake Fire

Albert J. Simard

Project Leader, Fire Management Planning for the Northeastern United States North Central Forest Experiment Station, USDA Forest Service, East Lansing, Mich.

It was Monday, May 5, 1980. The skies were clear over the Huron National Forest in northeastern Michigan. The plan for the Crane Lake prescribed burning unit called for the establishment of 210 acres of habitat favored by the endangered Kirtland's Warbler. After a final check of weather conditions was made, firing started at 10:25 a.m. There was some "spill-over" as firing progressed, but spot fires had been anticipated and were quickly controlled. Around noon, however, the fire jumped into standing timber and quickly ran east toward Highway 33. When it reached the highway, it torched and then spotted 200 feet across to the east side of the highway. Thus began the Mack Lake fire.

A tractor-plow unit attacked the escaped fire east of the highway within 3 minutes of detection, but to no avail. The fire torched in some reproduction, dropped to the ground briefly in a patch of mature timber, then crowned in a stand of jack pine saplings just 100 feet from the highway. The operators of a 6x6 tanker unit who caught and passed the tractor later reported that, despite progressing at 4 to 6 miles per hour, they never saw the head of the fire.

While working the north flank about one-half mile east of Highway 33, the tractor was caught between a crown fire burning northward across its path and a second eastmoving crown fire that had crossed the plow line behind the tractor. The operator was trapped and killed in the fire.

At this time, the main fire front was advancing eastward at 2 miles per hour (160 chains per hour). This partially resulted from spotting at least a quarter of a mile ahead of the fire. One hour after the fire had escaped, walls of flame 30 to 50 feet high passed through the town of Mack Lake, 2 miles east of the escape. Like so many other large fires, it destroyed many homes while leaving other neighboring houses unscathed.

Three hours after the fire escaped, it had advanced 6 miles. During the afternoon of May 5th, no amount of line or width of road held or slowed the fire. That afternoon the fire released the energy equivalent of 340,000 barrels of oil, or six times the energy of the Hiroshima atomic bomb.

At 4:30 p.m., a frontal passage brought the usual north wind shift but no rain. By 6 p.m., the fire had advanced an additional 3 miles (about 1¼ miles per hour). Because of the wind shift, however, the fire front had expanded from 2 to 6 miles wide and was now advancing southward. At this time, firefighters got their first major break—the fire ran out of jack pine. Although the wind did not diminish during the evening and the nighttime relative humidity did not rise above 55 percent, the forward rate of advance dropped to about 7 feet per minute (5 chains per hour) as the fire burned through hardwood stands.

By daybreak on May 6th, major control efforts were underway. In contrast to the previous day, firefighters experienced little difficulty containing the blaze. The perimeter did not change appreciably after May 5th.

Environmental Conditions

What were the environmental conditions that led to the Mack Lake fire, which took one human life, destroyed or damaged 41 dwellings (including 39 summer homes) and consumed 20,000 acres of jack pine in less than 6 hours?

Weather.—There was no indication of drought condition at the time of the fire. Total precipitation from January 1979 through April 1980 was near normal. Spring fire danger had been erratic. Except for 2 days of moderate danger, it was either too wet to burn (14 days) or the burning index was high to very high (19 days). Although 0.7 inch of rain fell on April 30th, midafternoon relative humidities on the 3 days before the fire averaged only 23 percent. As a result, fine fuels had dried completely since the rain. Conditions at 2 p.m. on May 5th were: Temperature, 82° F; windspeed, 18 miles per hour (gusting to 25+); and relative humidity, 22 percent.

Fuels.—The fire made its major run in stands of jack pine that had regenerated after a 16,400-acre fire that burned the same area in 1946.

Although stocking density, tree height, and stem diameter varied considerably typical stands contained 1,500 sapling to pole-size stems per acre, 15 to 25 feet tall. Fine surface fuels (duff, grass, ferns, lichen, and shrubs) averaged 10 tons per acre, and scattered larger material and crown foliage averaged an additional 10 tons per acre. Jack pine foliage moisture was at the seasonal low (110 percent of over-dry weight). This is much lower than the post-flush average moisture content and about 30 percent lower than would be expected in late summer. Low foliar moisture probably contributed to the extreme spread rate of the Mack Lake fire, but by itself was probably not a major factor. Surface fuels were in an early transitional stage, but the previous material predominated. Further, because of below normal winter snowfall, the fuels had not been compacted. The fire consumed an average of 11 tons of material per acre. Further evidence of the lack of drought was that most material larger than ½-inch in diameter was not consumed other than in the piled slash in the prescribed burn area.

Topography—Much of the fire area is rolling with numerous small ridges and valleys. Typical slopes average 20 percent, with elevational differences of less than 100 feet. Roads are the only barriers to fire spread in the terrain.

The Lessons of Mack Lake

In summary, three key factors contributed to the extreme spread of the Mack Lake fire: Relative humidity of 22 percent, wind speed of 18 miles per hour, and a jack pine timber type. These and similar conditions are not rare in the northeast. Crown-fire spread rates ranging from 1 to 2 miles per hour and long-range spotting have been reported previously and will be observed again.

Fire managers can learn several important lessons from the Mack Lake Fire:

1. Once a crown fire begins in the jack pine timber type, only a change in weather can slow the fire. Fire managers should consider creating fuel breaks composed of hardwoods.

2. Because residences near jack pine forests are increasing, an expanded program should be developed to tell homeowners about the potential for wildfire damage and how to locate and landscape their homes to prevent loss.

3. Fire managers need to plan carefully the transition from prescribed fire to wildfire control, because abandoning a prescribed fire when control actions begin can allow more escapes that threaten initial attack crews.

4. Because fires in jack pine can develop from initial attack to project scale in 15 to 30 minutes, fire managers need to develop mobilization procedures so that their organizations can respond within that time.

5. Procedures for the safe use and control of heavy-duty equipmen need to be emphasized. The speed and ruggedness of the equipment can allow it to outrun backup forces and to lull the operator into a false sense of security.

6. Lake States fire managers need to recognize that, because staff turnovers in this area are more frequent than major fires, special emphasis on training is needed so that firefighters can be prepared for major outbreaks.

Nature works on a much grander scale and longer timetable than people. One or more decades may elapse before all circumstances are just right again, but we must not allow the passage of time to cloud the memory of all the lessons that Mack Lake can teach us. ■

Windrows Vs. Small Piles for Forest Debris Disposal

Ragnar W. Johansen

Research forester, Southern Forest Fire Laboratory, Southeastern Forest Experiment Station, USDA Forest Service, Macon, Ga.

After a timber stand is harvested, debris left over from the harvest must be removed. If material is small, a broadcast burn is usually effective. Unfortunately, broadcast burning will not dispose of material over 2 inches in diameter. The short burning time of such fires does not permit ignition and sustained combustion of the larger material. One way in which larger material can be burned is to pile it in mixture with the smaller size fuel. The reinforcing radiation of burning particles nearby will allow more complete combustion of the large material.

Slash piles are generally constructed in one of two ways: As round, haystacklike piles (fig. 1); or as long, windrow piles that extend the length of a clearcut area (fig. 2). Spacing of piles and windrows depends on the amount of slash and the carry distance for piling equipment. Windrows are most common in the South, but small piles offer some advantages that make them worth considering.

Figure 1.—*Small haystacklike piles of debris.*

Small Piles Burn Faster

There appear to be good reasons for expecting that haystacklike piles would burn faster than windrows. When woody material flames, it is in the gas evolution phase of combustion. Individual particles, usually not exceeding one-half inch in diameter, will sustain flame at the particle surface as long as the gasses from pyrolysis continue to be evolved and the resulting air-gas mixture is combustible. Groups of particles gathered into a pile behave much the same way, except that flaming takes place at the outer pile surface once the pile is enveloped in flames. At this stage of combustion, oxygen is usually not available to particles inside the pile, but those particles provide the combustile gasses that combine with oxygen in the air at the pile surface in flaming combustion. If more air can be supplied to the combustible gases, the combustion rate will increase proportionately.

A windrow however, has less surface area per volume of wood than does the same debris gathered into many small piles. Thus, fuel in small piles has more air for combustion. If one envisions small piles as short pieces of a long windrow, the additional surface area created by using small piles instead of windrows then becomes obvious (fig. 3).

Film records also show a more rapid combustion rate of debris in small piles. Two time-lapse cameras were pointed at (1) a 600-foot row of small piles and (2) an adjacent

Figure 2.—*Windrowed debris.*

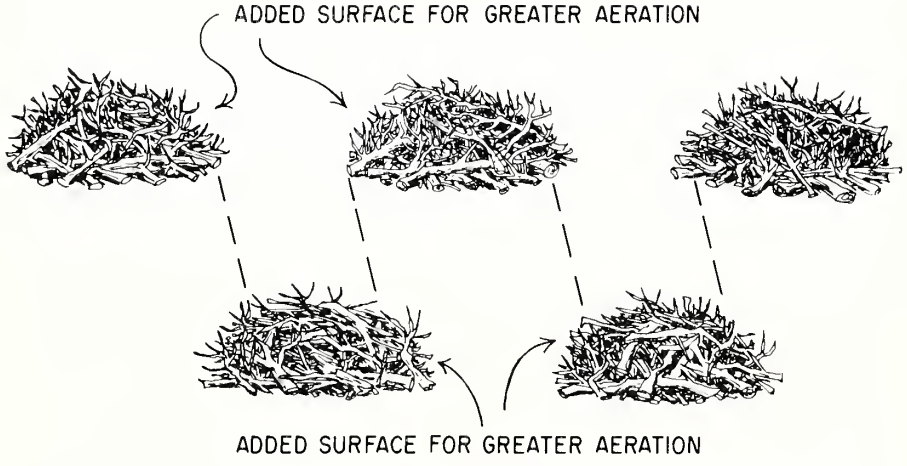

Figure 3.— *Removal of sections of a windrow pile illustrates why more surface area is exposed to air when small piles are constructed instead of windrow piles.*

500-foot windrow on a clearcut area. Fuel weight was similar per unit length of row for each, but small piles were slightly higher (not exceeding 5.5 feet), and pile bases were wider. Flaming burnout time for small piles was over three times faster than for windrows, and maximum flame length was over twice as high (fig. 4). This is a single case observation, and conditions for fuel consumption were optimal. Piling was done when the soil was dry so that soil inclusion in the piles was minimal. At the time of burning, the area was suffering severe drought, with the Keetch-Byram drought index at 652 (Keetch and Byram 1968), and relative humidity lows of under 20

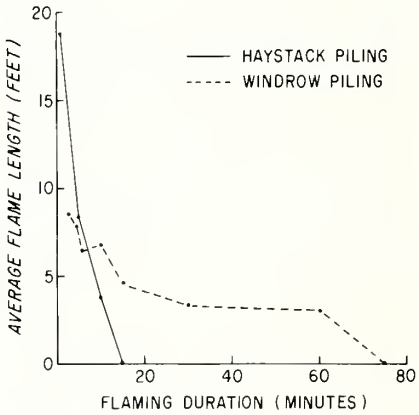

Figure 4.— *Fire behavior during the course of flaming combustion in piled debris in Toombs County, Ga.*

percent were recorded for the 2 days preceding the low of 15 percent on the day of the burn. The fuel could not have become much drier.

Small Piles Produce Less Smoke

One basic approach to reducing particulate matter production from prescription burning is to maximize the flaming combustion stage of burning, thus minimizing the smoldering stage (Southern Forest Fire Laboratory Staff 1976). The reason is clear. Smoldering combustion has a much higher emission factor (pounds of particulate matter produced per ton of fuel consumed) than flaming combustion, and burning takes much longer. By virtue of the higher combustion rate, small piles favor the flaming combustion stage of burning; thus they minmize not only flaming combustion time, but also smoldering combustion. This would shorten the total burning time and emission period.

A higher combustion rate has the second advantage of lofting the smoke higher over the burning site. Higher lofting allows for greater smoke dispersion downwind before the smoke reaches the ground.

Two other necessary means for reducing smoke are (1) working only under site conditions that will minimize soil in the piles and (2) burning piles only when the fuel is dry enough to get rapid consump-

tion. Emission factors are believed to increase as fuel moisture increases.

Small Piles Improve Access to the Area

Small piles have some decided physical advantages over windrows. If the debris cannot be burned before planting, access within the area would be relatively unobstructed because of the open spaces between piles. Unburned or poorly burned windrows physically obstruct movement of people and machines except in the direction parallel to the windrow. Mobility is especially important in the event that future fire control effort is necessary in the area. Wildlife mobility is also unrestricted when small piles are used.

Piling Costs Are Comparable for Small Piles

Before anyone would change from a windrow piling to another type of piling, he or she should consider the costs of small piles and windrows. Three preliminary time studies on the two methods of piling were conducted by Union-Camp Corporation in Georgia.[1] Two studies were on Union-Camp's Satilla Forest, Glynn County, and one was on their Oconee Forest, Toombs County. On the Satilla-1 test area, two Caterpillar tractors with root rakes were worked together for windrow piling on 10 acres and then together for small piling on an adjacent 10 acres. Both operators were experienced in making windrows, but had done little haystack-style piling.

The Satilla-2 tests were conducted with the same tractors and operators as on the Satilla-1 area. Again, the tractors worked together to complete all the windrowing on 15.4 acres before making small piles on 13.1 acres.

[1] Arthur G. Bunker, Union-Camp Corporation Report, Woodlands Division Savannah, Ga. May 1978.

Table 1.—*Time study on use of D-6 tractors to window and to make small piles of debris after slash pine clearcut logging operations.*

Test		Windrow piling		Small piling		Comparisons
		Acres treated	Minutes per acre	Acres treated	Minutes per acre	
Satilla	1	10	55.2	10	61.7	Windrow production 11.8 percent greater per unit time
Satilla	2	15.4	57.6	13.1	57.2	Small-pile production 0.7 percent greater per unit time
Oconee	1	3.4	55.3	5.4	63.9	Windrow production 15.6 percent greater per unit time

On the Oconee Forest test, a single D-6 Caterpillar tractor with operator was used to make both types of piles. Although experienced in windrow piling, this operator was inexperienced in making small piles. During the course of 1 day, he windrowed 3.4 acres and small-piled 5.4 acres (table 1). In two instances, debris was piled from 12 to 16 percent faster in windrows than in small piles. In one test, small piles were constructed slightly faster. Since the tractor operator was not experienced in the small pile construction, the disparity in construction times may have been exaggerated. Gathering forest debris into small piles can be accomplished almost as quickly as windrow piling using the same equipment.

Literature Cited

Keetch, John J.; Byram, George M. A drought index for forest fire control. USDA For. Serv. Res. Pap. SE-38. Asheville, NC: Southeast For. Exp. Stn.; 1968; 32 p.

Southern Forest Fire Laboratory Staff. Southern forestry smoke management guidebook. USDA For. Serv. Gen. Tech. Rep. SE-10. Asheville, NC: Southeast. For. Exp. Stn.; 1976; 140 p. ■

Student Firefighters—A Success Story

George Martin

District Ranger, Blacksburg District, Jefferson National Forest, USDA Forest Service, Blacksburg, Va.

Although mechanized tractor-plow units have utility for fire suppression on toe slopes and valleys, firefighting is essentially a workforce-handtool function. Availability of enough trained firefighters to fight these fires has been a constant problem on National Forest land since acquisition of these lands began in the 1930's. The use of air tankers since the early 1960's, smoke jumpers from 1971 to 1975, and the recent introduction of helicopters and water-handling equipment have enhanced initial attack and mop-up capabilities. However, the 20-person fire crew remains the basic suppression unit, and availability of adequate forces remains a basic problem.

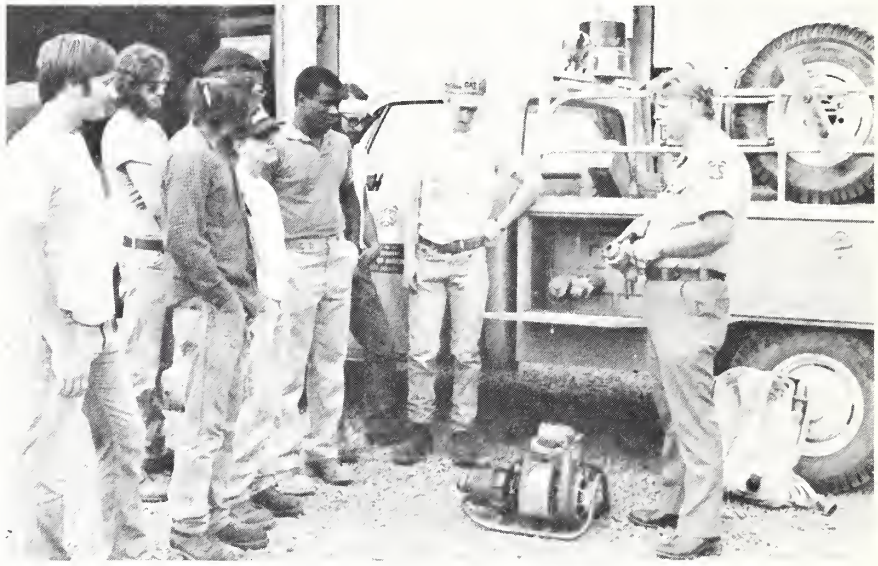

Figure 1.— *District Fire Control Officer instructing students about water handling equipment.*

The Beginning

In 1971, the Blacksburg Ranger District, Jefferson National Forest, and the Virginia Division of Forestry (VDF) initiated a cooperative program with Virginia Polytechnic Institute and State University (VPI) to make available student suppression forces. The Blacksburg District Ranger and District Forester with the VDF met with the VPI Forestry School Director to develop a training program and coordinate the academic requirements for the students. In the fall of 1971, 80 students received 8 hours of basic fire suppression training in the areas of fire behavior, fire tool use and safety, fireline construction, water han-

Figure 2.— *Assistant Ranger instructs students about fire cache maintenance and fire tools.*

dling, mop-up procedures, and administrative procedures. Since that time, from 100 to 200 students have been trained annually (figs. 1,2).

From 1971 until 1978, VPI&SU students received the basic 8-hour training. In 1979, the training was expanded to 32 hours to meet minimum Federal standards for fire suppression qualifications. To date, the students have been employed for suppression of over 100 fires in the Forest Service Southern Region States of Virginia, West Virginia, Kentucky, North Carolina, Georgia, and South Carolina. In 1977, VPI&SU students were dispatched to the 3,000-acre Green Butte Fire, Deschutes National Forest, Pacific Northwest Region Oreg., and the 60,000-acre Hog Fire, Klamath National Forest, Pacific Southwest Region Calif. In 1979, the students aided in the suppression of the West Fork Barker Creek Fire in the State of Montana and the Grant Creek Fire on the Lolo National Forest, Northern Region, Mont.

Besides receiving training, each student must attain a score of 45 on the aerobic fitness test administered by the Forest Service. Blacksburg Ranger District personnel administer the test on campus during the first few weeks of the academic year.

The students are paid minimum wage by the VDF and the prevailing pay rates for emergency firefighters by the U.S. Department of Agriculture Forest Service. While the student is in firefighter status, meals, housing (in many cases, a paper sleeping bag), and medical attention are furnished by the employing agency.

At the program's conception, Dr. Richard Vasey of the VPI Forestry School was designated as the faculty coordinator. As fire orders for suppression crews are received, the Blacksburg District Ranger or the VDF District Forester for State fires contacts Dr. Vasey to request crews. For National Forest fires, the coordinator then contacts individual firefighters from a master fire roster and directs the students to report to eigher the Forestry School building for transportation or directly to the Blacksburg Ranger District administrative site.

The students complete a university "chit" sheet that includes name, social security number, starting time, step test score, and information regarding emergency contacts and physical condition. Upon arrival at the administrative site, the Blacksburg Ranger District overhead team organizes the students into crews. Forest Service Crew Bosses and Crew Liaison Officers are assigned. Each firefighter is issued personal protective equipment, and a fire time report is initiated. The crews are then immediately dispatched to the ordering unit for suppression assignments or held for standby.

Squad Boss Trainees

After several years into the program, Blacksburg Ranger District personnel and the VPI&SU coordinator recognized the emergence of numerous student firefighters who, through fire suppression experience, had developed expertise and leadership qualities. This recognition coupled with the difficulty in securing adequate overhead personnel for duty with the students spurred the Forest Service to develop a squad boss training program in addition to the basic program. Because the squad boss assumes a great deal of responsibility on an organized crew, a very intensified curriculum for the training was developed. After careful screening by the university, 30 trainees were selected for the first session. Three subsequent sessions have been held.

The squad boss session begins at 8 a.m. on Saturday and continues for 30 consecutive hours. Besides receiving detailed training in fire suppression techniques, the potential squad bosses are introduced to fire business management procedures and specific leadership principles. At 6 p.m., the students are organized into five six-member squads and each squad is assigned a separate compass course in the mountains of the Blacksburg District. Each squad member serves as squad boss during the course of the assignment. A simulated fire camp is established for fire overhead personnel.

Throughout the night, district personnel transmit, by radio, simulated fire emergency situations to the squads and document performance of the squad bosses in dealing with the situation. No specific direction as to how to handle the situation is provided. Check points, panic azimuths, and pickup points are established beforehand for safety in case an actual emergency occurs. The compass course is usually completed at 7 a.m. Sunday morning. After a brief rest period, the trainees critique the night session, and training continues.

Throughout the 30-hour session, the students must demonstrate the ability to make decisions under stress, are tested on practical knowledge attained, and are paticularly examined for their attention to the welfare of squad members. Finally, each trainee is administered both a formal written and a practical examination. Both examinations must be passed if the student is to be certified to the university as a squad boss.

University Coordination

Very close coordination with the University is a requisite to the success of the student firefighter program. The emphasis in both the basic firefighter course and the squad boss session is to make students fully aware that their primary concern must be their academic achievement. Based upon this premise, VPI has developed a policy that each student must follow. The policy states essentially:

- The student must make the decision as to whether to respond to a fire call. All firefighting activities are voluntary.
- When a fire order is received, the Forest Service provides a probable duration for the detail. If a student has a scheduled commitment such as an examination within that period, he must refuse the fire detail or accept the consequences of missing the examination.
- The student is excused from academic commitments that were unscheduled (such as pop tests) within the probable duration.
- If, because of unforeseen difficulties, the detail extends beyond the probable duration, the University will allow the student to make up commitments missed.
- To remain on the active fire roster, students must maintain a specified grade point average.
- All students must be recruited through the VPI faculty coordinator rather than directly through the Forest Service or VDF.
- Finally, by direct request of the Forest Supervisor, the Department head may declare a fire emergency which waives some of the aforementioned requirements.

The Keys to Success

The success of student firefighting programs depends upon several factors. The University must support the programs. One major difficulty is the absence of students from classes. Faculty members must reschedule examinations, adjust or accelerate schedules, and even prepare new tests and documents as makeups for legitimate absences.

The program coordinator must be patient, dedicated, and willing to accept the added responsibility for the program. Frequently, 200 phone calls might be required to enlist a 20-man crew; fire orders inevitably originate at 2:00 a.m.; and the welfare of students is an ever-present concern.

The Forest Service and State agencies must insure that training is thorough and that capable overhead members are available for each student crew. Unlike regular agency firefighters, students may experience a time lapse between the training period and an actual fire occurrence. Responsibile overhead members must recognize that en-route and on-the-line refresher training is a must. Also, student crewmember have no knowledge or authority related to administrative procedures relevant to the transportation, feeding, housing, and the welfare of the crew.

Students must be committed to maintenance of academic standing and demonstrate maturity in accepting or rejecting fire assignments.

The VPI and SU firefighting program has been a tremendously successful endeavor. In addition to outstanding performance on the Jefferson National Forest and in the State of Virginia, VPI crews have boasted outstanding performance ratings in eight States within four Forest Service Regions.

In the spring of 1979, the student firefighting program stimulated the interest of a Ferrum College student, who formed a student firefighting organization. The Forest Service and VDF cooperated with Sam Litton, faculty advisor for the organization, and trained 50 students from various academic disciplines. In late summer, members of the Ferrum College crew achieved outstanding performance ratings for suppression activities on the 6,000 acre Otay Fire in southern California.

A well-planned program can produce the following advantages to the students, the institution, and the firefighting agency:

- A balanced mix of academic excellence and practical experience.
- An available cache of trained firefighters.
- Relief to an often overtaxed supply of fire overhead personnel.
- With minimum QCA requirements, an incentive for greater academic achievement.
- An opportunity for students to supplement educational funds. ■

Thirty-Ninth Forest Fire Prevention Campaign Begins

Donald T. Hansen

Smokey Bear Program Manager,
USDA Forest Service,
Washington, D.C.

With more Americans entering our forests each year, now more than ever it's up to every one of us to guard against the preventable destruction that people-caused fires can bring. Once again Smokey Bear spearheads this year's Advertising Council's drive—the 39th advertising campaign to protect America's forest resources from this shameful blight.

Forest Fire Prevention (FFP) is the Ad Council's second longest-running campaign, ranking just behind U.S. Saving Bonds. Since the drive began in 1942, the number of forest fires in this county has been cut in half. Over $17.5 billion worth of natural resources and beauty has been saved during this period, although 10 times more people are visiting forests today than when the campaign began.

The coming of summer brings a marked increase in the number of Americans visiting our forests and woodlands. A dry summer and fall will also boost the chances of brush and forest fires, and the devastation they can bring to private property and the environment.

The Council has distributed a brand-new series of national FFP public service advertising messages to newspapers and magazines.

"Please. America is not your ashtray," pleads the headline on one Public Service Announcement (PSA) that pictures woodlands and mountains inside a giant ashtray menaced by a cigarette looming overhead (fig.1).

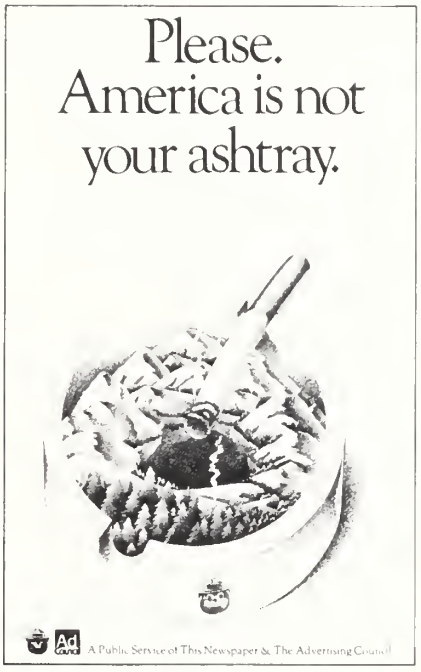

Figure 1.— *One of the eye-catching print messages in the 1981 Forest Fire Prevention Campaign.*

"You lose a lot when you lose a forest" states copy in another message, which features line drawings of ducks, wildflowers, and fish—all certain casualties in a raging forest fire.

Every year, the Council also distributes public service announcements to the radio and television media, and conducts a special Southern Fire Prevention campaign in 12 Southern States. Several new print and broadcast messages for the Southern effort in 1981 feature the popular country and western singer Tom T. Hall (fig. 2).

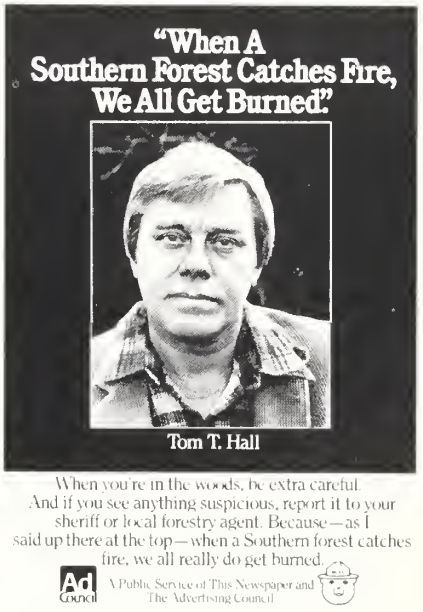

Figure 2.— *Singer Tom T. Hall is featured in print and broadcast PSA's in this year's Southern Fire Prevention effort.*

Arson remains a continuing problem in the South, and copy in many Southern Fire Prevention messages urges citizens to report anything suspicious to their sheriff or local forestry agent. Today the South provides nearly one-third of the Nation's wood, representing thousands of jobs and millions of dollars to its people and communities. So when southern forests burn, the effect on this region's economy is especially severe.

The Ad Council conducts the FFP campaign for the Forest Service, U.S. Department of Agriculture, and the National Association of State Foresters. Volunteer coordinator is Lewis R. Angelos, Manager, Cooperate Advertising/ Consumer Affairs, Atlantic Richfield Co. Foote, Cone & Belding/Honing, Inc. is the volunteer advertising agency. For the Southern Fire Prevention program the volunteer coordinator is William A. Binns, Public Relations Manager, Union Camp Corp. Liller Neal Weltin, Inc. is the volunteer advertising agency.

For further information contact: Donald T. Hansen, Smokey Bear Program Manager, USDA Forest Service, P.O. Box 2417, Washington, DC 20013 (703-235-8023, National Campaign); Roger Hatch, USDA Forest Service, Southern Area, 1720 Peachtree St., NW, Atlanta, GA 30309 (404-881-3736, Southern Campaign). ■

Checklist Developed for Firefighters

The Northeastern Area-State and Private Forestry has developed a sturdy plastic checklist to be issued to State firefighters going on national fire details.

This handy checklist helps firefighters remember the basic items required for fire details.

Reasonable quantities of the card are available free from:

USDA-FS-NA-S&PF-CFFM
370 Reed Road
Broomall, PA 19008■

Personal Gear Checklist for State Crews on National Fire Details

Needed

*Nomex shirt and trousers, fire shelter
*Hardhat with chinstrap and headlight clips
*Boots, heavy duty, lace (in accordance with approved Guidelines for Boots for Firefighting)
*Gloves, leather or equivalent, unlined
*Interagency Fire Qualification Card (SF-228)
Pants, cotton, work, cuffless (1-2 pr)
Shirt, cotton, work, long sleeved (1-3 ea)
Duffel bag or large packsack
Socks, heavywork (6 pr)
Jackets, 1 heavy, 1 light
Sweater or sweatshirt (substitute for light jacket)
Underwear (4 sets)
Handkerchiefs (4) (include bandana size)
Towel, wash cloth, soap
Toilet kit with safety razor
Toothbrush, toothpaste
Chapstick, foot powder
Watch
Cash ($25-50)

Optional

Pocket notebook, ballpoint pen
Small flashlight for camp use
Shoes or sneakers for camp use (avoid slippery soles)
Pocket compass
Pocket knife
Eyewash
Long underwear (for cold night sleeping)
Soap, laundry, small box

*Mandatory items 5/27/80

Front of card

Notes for State Crews on National Fire Details

1. Keep weight and bulk of personal gear to a minimum. Total weight should not exceed 35 pounds. Use duffel bag or packsack...no suitcases! Tag or mark all gear.

2. Commissary items usually available on project fires within 2 days. Tobacco, cigarettes, and candy provided but deducted from final payment. Cash may be needed for incidental purchases while traveling or when on approved rest and rehabilitation time.

3. You might like to take sunglasses, writing paper, stamps, and personal preference brand tobacco items. Prescription medicines or copies of prescriptions may be desirable. Cameras not recommended for fireline forces. Avoid taking valuable items.

4. Check your state mobilization plan for further details.

**USDA FOREST SERVICE
NORTHEASTERN AREA
STATE AND PRIVATE FORESTRY**

Back of card

Fire in the Big Cypress National Preserve, Florida

Dale L. Taylor and Regina Rochefort

National Park Service Research Biologist; and Research Ecologist South Florida Research Center, Everglades National Park, Homestead, Fla. The Research Center has responsibilities for the Big Cypress National Preserve.

The Big Cypress Preserve was established in 1974 and encompasses 570,000 acres (230,769 hectares) in southwest Florida. Fire control responsiblities for 62 percent of the preserve came under National Park Service direction in November 1978, with responsibility for the remaining 38 percent assumed during December 1979. First year records show the preserve to be one of the most fire prone areas within the National Park Service.

Park Service policy directs that all people-caused fires be extinguished to prevent the natural fire frequency from being exceeded. Where fire management plans document historic fire occurrence, lightning-caused fires (prescribed natural fires) are allowed. Prescribed management fires can be used as a substitute for lightning fires where fire management plans document their need to perpetuate certain biotic communities.

In the Big Cypress Preserve, nonauthorized, people-caused fires are set maliciously or to improve hunting by stimulating browse species, to reduce fuel around campas, or to control mosquitoes. Whether National Park Service personnel or cabin owners should burn around the nearly 400 hunting camps and recreational cabins to protect them from fire is an issue now being discussed. Permits are issued for non-National Park Service personnel to burn rangeland within the preserve.

Small fires during the appropriate season consume fuel and would reduce potential for fires to burn out cypress domes and strands as occurred in 1974. If all fires are stopped and fuel is allowed to build up, a repeat of the 1962 Shark Valley fire that burned a combined total of 184,544 acres in Everglades National Park and part of what is now the big Cypress National Preserve may occur.[1]

Because the preserve has so many unauthorized fires outside of the natural (lightning-caused) fire season, a prescribed fire research program has been initiated to help managers decide on season of year and frequency for prescribed burns.

Vegetation and Climate of Big Cypress Preserve

Big Cypress has a diverse mosaic of vegetation types (McPherson 1973). Some areas (marl prairies fig. 1; cypress prairies fig. 2; and pinelands, fig. 3) can withstand fire, but other (cypress strands, cypress domes, mixed swamp forests, inland marsh, and hammock forest) are destroyed by fires that burns the organic soil (table 1). Wade and others (1980) have described impact of fire on these community types.

Climate is subtropical with alternating wet and dry seasons. Rainfall for 1979 totaled 51.7 inches at the Oasis Ranger Station, but wide annual fluctuations between 35 and 80 inches may occur in south Florida (Leach and others 1972). June to October is the wet season when water covers the soil surface in most community types except pineland and hammocks, and when most cloud to ground lightning occurs.

1979 Fire Year

During 1979, 81 reported fires burned 24,140 acres (table 2, fig. 1). All lightning-ignited fires occurred in May and accounted for less than 1 percent of the total area burned. By contrast, Everglades National Park, which adjoins the preserve, reports 28 percent of all fires are lightning-caused (Taylor 1981). Burning by permit on rangelands resulted in 11 percent of the acres burned. Nonauthorized people-caused fires accounted for 89 percent of all fires, 89 percent of acres burned, and 99 percent of the suppression cost. Forty-one percent of all fire starts were on a Sunday. A high proportion of Big Cypress fires were concentrated along roads or along the west boundary (fig. 4). Twenty-four fires (30%) were larger than 100 acres, with one fire burning 3,200 acres and one burning 4,077 acres. Sixty-two fires (77%) were larger than 10 acres.

The people-caused fire season in south Florida extends from November through May, the period with lowest rainfall. No fires were reported for August and September when rainfall and water levels are highest (table 2, fig. 5).

[1] On May 27, 1981, a 150,000-acre fire was burning.

Figure 1.—*The prairie vegetation type.*

Figure 2.—*The cypress prairie vegetation type.*

Figure 3.—*The pinelands vegetation type.*

Table 1.—*Vegetation types within the Big Cypress National Preserve (McPherson, 1973). The cypress forest has been subdivided into three units and apparent fire requirements/effects on each community have been added by this author*

Vegetation type	Acres	Fire requirements/effects
1. Cypress forest	249,000	
a. Cypress stands		Destroyed by fire during drought.
b. Cypress domes		" " " " " " "
c. Cypress prairie		Burned frequently by man (almost annually). Affected adversely by fire during dry seasons.
2. Marl prairies	137,600	Burned almost annually.
3. Pineland	102,400	Burned almost annually, probably adversely affected by fire during the dry season.
4. Mixed swamp forest	37,120	Potentially destroyed by fires.
5. Inland marsh	23,680	Potentially destroyed by fire, especially during drought conditions.
6. Hammock forest	9,600	Potentially destroyed by fire.
7. Coastal forest	7,680	Unknown, fires are rare.
8. Coastal marsh	5,120	Fire occurs naturally, but frost is a more important influence.
9. Agricultural/disturbed	3,200	Fire may be required to control exotic plants/may carry fire annually.

Monthly fire patterns show a definite relationship between acres burned and hunting uses within the preserve. Number of fires and acres burned were highest in November, December, January, and March (fig. 5), months when the hunting season is open within the preserve. Only one wildlife management unit has an open hunting season (the "black powder deer season") in October, and all three fires that burned in that month were within that unit. Few fires occurred during February, a month when precipitation is low but hunting is closed within the preserve and few visitors use the area (Fred Dayhoff, personal communication). Hunters usually like to keep burns small so that game can easily be seen within the burned area. As the dry season progresses, however, the average size of fires increases and peaks in April (table 2). The most fires (25%) and highest acreage burned (38%) were during March.

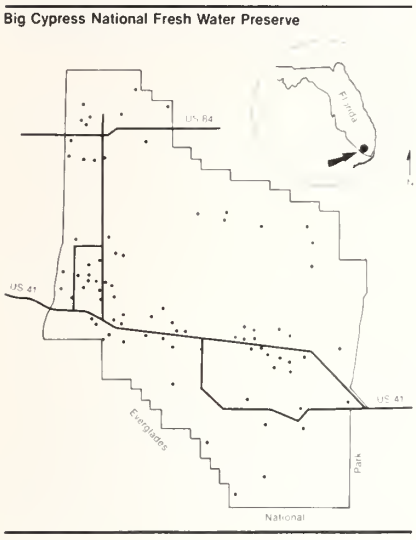

Figure 4.—*Location of 1979 fires within Big Cypress National Preserve.*

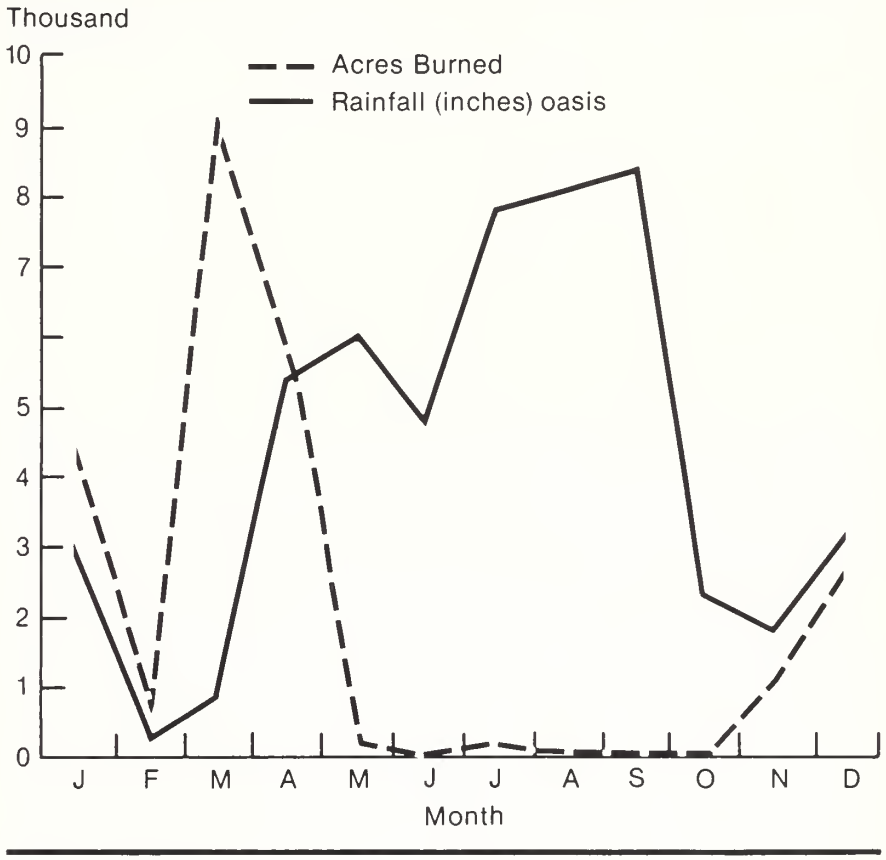

Figure 5.—*Rainfall and acres burned by month in Big Cypress National Preserve.*

Nearly 100 percent of the fires in the preserve occur within three vegetation types: Marl prairies, cypress prairies, and pinelands (fig. 6). Marl prairies are graminoid associations dominated by *Muhlenbergia filipes, Cladium jamaicensis,* and *Paspalum* spp. Cypress prairies are open dwarf cypress (*Taxodium ascendens*) forests with a graminoid understory. During the dry season, marl prairie and cypress prairie fires are fast moving and can burn many acres. Pinelands, on the other hand, are isolated islands interspersed in marl prairie and cypress prairie areas. They are dominated by south Florida slash pine (*Pinus elliottii* var. *densa*) with an understory of saw palmetto (*Serenoa repens*), cabbage palm (*Sabal palmetto*), and mixed grasses. Post-fire recovery is rapid in all three communities, and the potential exists for burning on an annual basis.

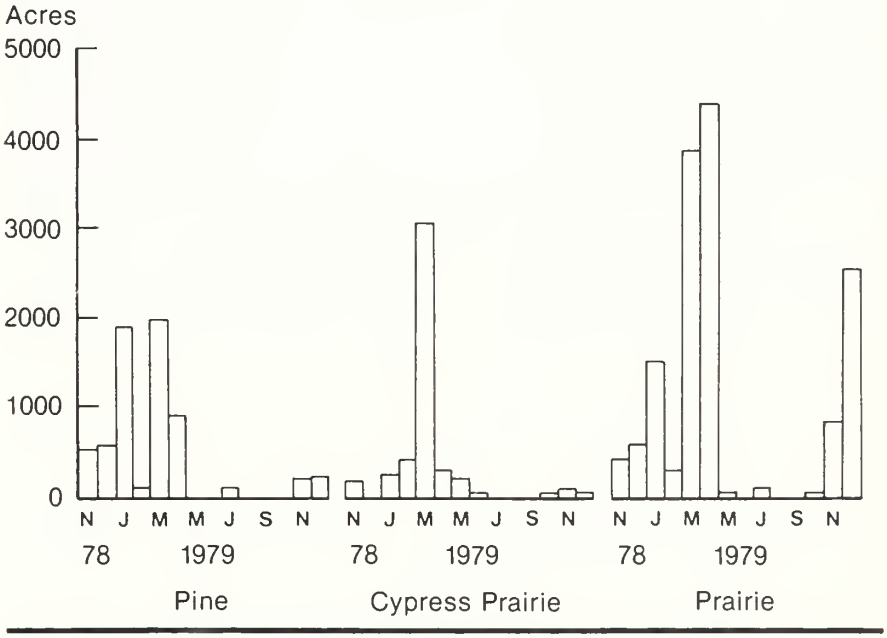

Figure 6.—*Number of acres burned by month in three vegetation types within Big Cypress National Preserve.*

Table 2.–1979 fire statistics for Big Cypress National Preserve[1]

Month	People-caused			Lightning-caused			Total		
	Number	Acres	Cost (dollars)	Number	Acres	Cost (dollars)	Number	Acres	Cost (dollars)
January	9	1,585	0[2]	0	0	0[2]	15	4,227	0[2]
February	5	736	1,228	0	0	0	5	736	1,228
March	20	9,236	16,194	0	0	0	20	9,236	16,194
April	6	5,801	4,575	0	0	0	6	5,801	4,575
May	3	160	177	3	23	162	6	183	339
June	1	4	29	0	0	0	1	4	29
July	2	130	232	0	0	0	2	130	232
August	0	0	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0	0	0
October	3	28	0	0	0	0	3	28	0
November	9	1,067	2,268	0	0	0	9	1,067	2,268
December	14	2,728	3,511	0	0	0	14	2,728	3,511
TOTALS	72	21,475	$28,214	3	23	$162	81	24,140	$28,376
Percent	(89%)	(89%)	(99%)	(4%)	(1%)	(1%)			
Averages		298	$ 392		8	$ 54		298	$ 350

[1]Pasture burning by permit allowed 6 fires in January (7% of total) that burned 2,642 acres (11% of total).
[2]No cost assigned for January.

Precipitation has a direct effect on the number of acres burned annually and how much of each vegetation type burns monthly. Pinelands and prairies have a shorter hydroperiod and dry out earlier than wetter cypress prairies. They are more easily ignited early in the dry season than the cypress prairies where burning usually peaks in March (fig. 6).

Prescribed Fire Plan

Study sites have been established in pinelands, marl prairies, and cypress prairies—plant communities where almost all fires occur. The 21 sites are each 50 acres in size. Eighteen sites are specified for burning at 1- or 3-year intervals during either the wet season (July through September), early dry season (October through December), or mid-dry season (January to early March). Attempts will be made to protect a control site in each community type, but this may be impossible because of a high incidence of arson. Prescriptions are to be extremely general, covering only season of the year and water levels at two gauging stations. Fire weather and behavior will be monitored during each burn. Changes in plant species composition, vegetation biomass, and plant phenology will be measured on established plots. Nesting birds will be censused during April and May. Results from these studies will be used to set basic fire management parameters for the three plant communities.

Literature Cited

Leach, S. D.; Klein, H.; Hampton, E. Hydrologic effects of water control and management in southeastern Florida. U.S. Geol. Surv. Rep. Invest. 60. Tallahassee, FL: U.S. Geol. Surv.; 1972; 115 p.

McPherson, B. F. Vegetation map of southern parts of sub-areas A and C, Big Cypress Swamp, Florida. Hydrologic Investigations Atlas H A. Washington, DC: U.S. Geol. Surv.; 1973.

Wade, D.; Ewel, J.; Hofstetter, R. Fire in south Florida ecosystems. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. SE-17. Asheville, NC: Southeast. For. Exp. Stn.; 1980; 125 p.

Taylor, D. L. Fire history and fire records for Everglades National Park, 1948–1979. Tech. Rep. T-619. Homestead, FL: South Fla. Res. Cent., Everglades Nat. Park; 1981; 121 p.■

1980 Smokey Bear Awards Presented

Smokey Bear awards are given annually as part of the Cooperative Forest Fire Prevention Program (CFFP) to organizations or persons who have rendered an outstanding and significant contribution to the cause of forest or range fire prevention.

The 1980 Golden Smokey statuette, given for outstanding service to forest fire prevention of national scope and effect over an extended period of time, went to the California Department of Forestry. The award was presented to the Department's director, David E. Pesonen, by Forest Service Chief R. Max Peterson, on behalf of the three sponsors of the program—the National Association of State Foresters, the Advertising Council Inc., and the United States Department of Agriculture Forest Service.

Silver Smokey statuettes, presented to persons cited for outstanding national or regional fire prevention activities were awarded to David D. Devet, Forest Service, Francis Marion and Sumter National Forests, South Carolina; E. Feldman Corn, North Carolina Department of Resources; and Richard T. Ford, California Department of Forestry.

Smokey Bear plaques, emblematic of outstanding State or Region-wide fire prevention activities were awarded to:

Gordon T. Rowley, Forest Service, Angeles National Forest

Golden Smokey—David E. Pesonen, (left), Director, California Department of Forestry (CDF), accepts the Golden Smokey statuette from USDA Forest Service Chief, R. Max Peterson. The award was in recognition of the CDF's outstanding activities in fire prevention over an extended time period.

Roy G. Hatcher, Iowa Conservation Commission

Bill Bell, Bell Sound Studios, California

Myron E. Ostrowski, Wisconsin Department of Natural Resources

Arthur Briggs, Manitoba Forestry Association, Canada

James T. Lenox, Ohio Department of Natural Resources

R. Ben Kinsey, Michigan Department of Natural Resources

Bobby H. McLane, Forest Service, Quachita National Forest

New Milford Volunteer Fire Company 2, New Milford, N.J.

Paul H. Faubell, New Jersey Bureau of Forest Fire Management

George "Bud" Beachwood, KOIN-TV, Portland, Oreg.

Any interested person, group, or organization may submit a nomination for one of these national awards with a recommendation of the State Forester, Regional Forester, or Area Director. The selection committee is composed of the members of the CFFP Executive Committee representing the Forest Service and the National Association of State Foresters.

Nominations for Smokey Bear awards are received each year by October 31, by the Director, Cooperative Fire Protection, USDA Forest Service, P.O. Box 2417, Washington, DC 20013. For more information on the awards and the nominating procedures contact Donald T. Hansen, Smokey Bear Program Manager, at (703) 235-8023.■

New Fusee Container Designed

Tony Jinotti, Fire Equipment Specialist for the United States Department of Agriculture Forest Service's Northern Region, recently fabricated fusee containers for the Region's ground tanker fleet. The containers are 14 ½ inches long, hold 11 standard fusees, and are built from 4-inch PVC, Schedule 40 plastic pipe. A 1-inch diameter hole was drilled in one of the end caps to make the fusees easier to remove from the container. The other cap was glued onto the container.

Two 4-inch worm gear hose clamps hold two chain links in place to facilitate tool box mounting. The links can also be used for securing a handle if the fusees need to be carried in the field.

Drawings may be obtained from USDA Forest Service, Northern Region, Federal Bldg., Missoula, MT 59807.■

Los Angeles Honors Tujunga Ranger District

California's Tujunga Ranger District of the Angeles National Forest was honored by the City of Los Angeles recently with a Resolution and Certificate of Appreciation for exemplary and conscientious service in the field of fire prevention. The honor was bestowed by Los Angeles Mayor Tom Bradley and Councilman Bob Ronka in the Council Chambers at City Hall.

Accepting for the Angeles National Forest were Ben Beall, District Ranger, and Manuel Mesa, Fire Prevention Officer, from the Tujunga District.■

California Ham Radio Operators Help in Fire Emergencies

The California Department of Forestry is developing a program in Riverside County using amateur radio operators to provide extra communications during emergencies. These radio enthusiasts are part of a statewide Volunteers in Prevention program aimed at involving private citizens in firefighting projects.

Thirty FCC-licensed ham operators recently took part in training intended to familiarize the volunteers with present State/county radio system methods. Primarily handling such logistics as supplies and equipment, operators will also serve as a back-up communications system, should the principal system fail.

Virginia Aerial Firefighting Techniques

An exercise in aerial firefighting techniques was held recently in Virginia. Participants included the Virginia Division of Forestry, the Office of Emergency and Energy Services, and the National Guard.

Guard helicopters used specially designed 150-gallon buckets, which were filled in a nearby river, to bring a fire in the dense pine forest in Providence Forge, Va., under control.■

Forest Service Firsts

In 1913 the first innovative firefighter's tool was designed by USDA Forest Service ranger Edward C. (Big Ed) Pulaski. The tool, a combination axe and mattock, can be used for chopping a tree or digging in the earth.

Big Ed distinguished himself in the terrible Idaho fires of 1910. Arriving at the fire, he saw that fighting was a hopeless battle, and the only thing left to do was save the men. He is credited with saving the lives of 45 firefighters.

The first portable two-way radio was built near Portland, Ore. by D.L. Beatty, a forest officer. Beatty, whose hobby was radios, had experimented with a small radio telegraph transmitter-receiver, and by 1930 had built a successful portable radio that greatly improved communications in firefighting.■

Recent Fire Publications

Andrews, Patricia L. Testing the fire behavior model. Proceedings, Sixth Conference on Fire and Forest Meteorology; 1980 April 22-24; Seattle. Washington, DC: Society of American Foresters; 1980; 70-77.

Banks, Stephen William. High winds whip fire through rough terrain near Palm Springs. West. Fire J. 33(4):48-51;1981.

Bevins, Collin D,; Barney, Richard J. Lightning fire densities and their management implications on Northern Region National Forests. Proceedings, Sixth Conference on Fire and Forest Meteorology; 1980 April 22-24; Seattle. Washington, DC: Society of American Foresters; 1980; 127-131.

Bevins, Collin D.; Roussopoulos, Peter J.,. National fuels inventory library. Proceedings, Sixth Conference on Fire and Forest Meteorology; 1980 April 22-24; Seattle. Washington, DC: Society of American Foresters; 1980; 146-149.

Burgan, Robert E. A handheld calculator—fire danger and fire behavior. Proceedings, Sixth Conference on Fire and Forest Meteorology; 1980 April 22-24. Washington, DC: Society of American Foresters; 1980; 65-69.

Davis, Kathleen M.; Clayton, Bruce D.; Fischer, William C. Fire ecology of Lolo National Forest habitat types. U.S. Dep. Agric. For. Serv. Res. Note INT-79. Ogden UT: Intermount. For. and Range Exp. Stn. 1980; 24 p.

Doolittle, M. L. Effectiveness of forestry agency personnel as fire prevention contactors. U.S. Dep. Agric. For. Serv. Res. Note SO-262. New Orleans, LA: South. For. Exp. St.; 1980; 7 p.

Eakle, T. W.; Wagle, R. F. Method of estimating ground fuels under two inches in diameter in southwestern ponderosa pine stands. U.S. Dep. Agric. For. Serv. Res. Note PNW-333. Portland, OR: Pac. Northwest For. Exp. St.; 1979; 8 p.

Fuquay, Donald M. Lightning that ignites forest fires. Proceedings, Sixth Conference on Fire and Forest Meteorology; 1980 April 22-24; Seattle. Washington, DC: Society of American Foresters; 1980; 109-112.

Furman, R. William. Using fire weather data in prescribed fire planning: two computer programs. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. RM-63. Fort Collins, CO: Rocky Mount. For. and Range Exp. Stn.; 1979; 11 p.

Gratz, David B.; Hawkins, Raymond E. Evaluation of smoke detectors in homes. Interim Report—Phase 1. Washington, DC; Fed. Emergency Manage. Agency, U.S. Fire Admin.; 1980; 27 p.

Harvey, H. Thomas; Shellhammer, Howard S.; Stecker, Ronald E. Sequoia ecology: fire and reproduction. Washington, DC: U.S. Dep. Int. Nat. Park Serv.; 1980; 182 p.

Kessell, Stephen R.; Fischer, William C. Protecting postfire plant succession for fire management planning. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. INT-94. Ogden, UT: Intermount. For. and Range Exp. Stn.; 1981; 19 p.

Landsberg, J. D.; Cochran, P. H. Prescribed burning effects on foliar nitrogen content in ponderosa pine. Proceedings, Sixth Conference on Fire and Forest Meteorology; 1980 April 22-24; Seattle. Washington, DC: Society of American Foresters; 1980; 209-213.

Latham, Don J. A fire season severity predictor. Proceedings, Sixth Conference on Fire and Forest Meteorology; 1980 April 22-24; Seattle. Washington, DC: Society of American Foresters; 1980; 93-95.

Maxwell, Wayne G.; Ward, Franklin R. Guidelines for developing or supplementing natural photo series. U.S. Dep. Agric. For. Serv. Res. Note PNW-358. Portland, OR: Pac. Northwest For. Exp. Stn.; 1980; 16 p.

Maxwell, Wayne G.; Ward, Franklin R. Photo series for quantifying natural forest residues in common vegetation types of the Pacific Northwest. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. PNW-105. Portland, OR: Pac. Northwest For. Exp. Stn.; 1980; 230 p.

National Wildfire Coordinating Group. Wildfire! Prevention Handbook. 1980; 6 p. Available from Outdoor Empire Publishing, Inc., P.O. Box C-1900, Seattle WA. 98109.

Nissley, S. D.; Zasoski, R. J.; Martin, R. E. Nutrient changes after prescribed surface burning of Oregon ponderosa pine stands. Proceedings, Sixth Conference on Fire and Forest Meteorology; 1980 April 22-24; Seattle. Washington, DC: Society of American Foresters; 1980; 214-219.

Olson, Craig M. An evaluation of the Keetch-Byram drought index as a predictor of foliar moisture content in a chapparal community. Proceedings, Sixth Conference on Fire and Forest Meteorology; 1980 April 22-24; Seattle. Washington, DC: Society of American Foresters; 1980; 241-245.

Pickford, S. G.; Fahnestock, G. R.; Ottmar, R. Weather, fuel, and lightning fires in Olympic National Park. Northwest Sci. 54(2):92-105; 1980.

Stickney, Peter F. Data base for post-fire succession first 6 to 9 years in Montana larch-fir forests. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. RM-62. Fort Collins, CO: Rocky Mount. For. and Range Exp. Stn.; 1980; 133 p.

U.S. Department of Agriculture, Forest Service. Operating guidelines—gelled fuel helitorch. Missoula, MT: U.S. Dep. Agric. For. Serv. Equip. Dev. Cent.; 1980; 22 p.

U.S. States Department of Agriculture, Forest Service. Planning for railroad fire prevention—fire prevention leaflet. 4 p. Available from USDA Forest Service, CFFM, Broomall, PA 19008.

U.S. Department of Agriculture, Forest Service. Proceedings of the Fire History Workshop; 1980 October 20-24; Tucson. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. RM-81. Fort Collins, CO: Rocky Mount. For. and Range Exp. Stn.; 1980; 142 p.

U.S. Department of Agriculture, Forest Service. Study-guide—Standards for survival (for suse with 16mm film of the same name). 18 p. Available from USDA Forest Service—CFFM, Broomall, PA 19008.

U.S. Fire Administration. After the fire—returning to normal. Washington, DC: Federal Emergency Management Agency; 1980; 24 p.

Viereck, Leslie A.; Schandelmeier, Linda A. Effects of fire in Alaska and adjacent Canada—a literature review. U.S. Dep. Int. BLM Rep. BLM/AK/TR-80-06. Fairbanks, AK: U.S. Dept. Int., Bur. Land Manage.; 1980; 124 p.

Wagle, R. F. Fire: Its effects on plant succession and wildlife in the southwest. University of Arizona RR-281. Tempe, AZ: University of Arizona; 1981; 82 p.

Wagle, R. F.; Eakle, Thomas W. A controlled burn reduces the impact of a subsequent wildfire in ponderosa pine vegetation type. For. Sci. 25:123-129; 1979.

Williams, Jerry T.; Martin, Robert E.; Pickford, Stewart. Silvicultural and fire management implications from timber type evaluation of tussock moth outbreak areas. Proceedings, Sixth Conference on Fire and Forest Meteorology; 1980 April 22-24; Seattle. Washington, DC: Society of American Foresters; 1980; 191-196.■

New, Improved Chain Saw Chaps

Stuart E. Putnam

Equipment specialist, USDA Forest Service Missoula Equipment Development Center, Missoula, Mont.

Chain saw chaps designed at the Missoula Equipment Development Center (MEDC) have been used by the Forest Service and other U.S. Government agencies for many years. MEDC's initial design work, completed in 1965, was patterned after pads found effective by the Quebec Pulp and Paper Association and the American Pulpwood Association.

Basic pad materials have remained essentially unchanged since the midsixties, but improvements in chain saw and chain cutter designs have reduced the pads' protective qualities. Forest Service field units recognized this problem and asked for chaps with better protection that were more comfortable to wear.

MEDC's chain saw pad tester (fig. 1) was redesigned to incorporate the latest chain saw and chain cutter improvements. A questionnaire sent to field units provided the basis for the chap redesign. A variety of new materials were evaluated for weight, cost, and protection. A value analysis method combined these three factors to determine the best pad materials for Forest Service chaps.

The new Forest Service pad for chain saw chaps uses two layers of woven Kevlar in combination with two layers of needlepunched (felted) Kevlar.[1] The new materials were incorporated into chaps with an improved outer shell material and leg strap design.

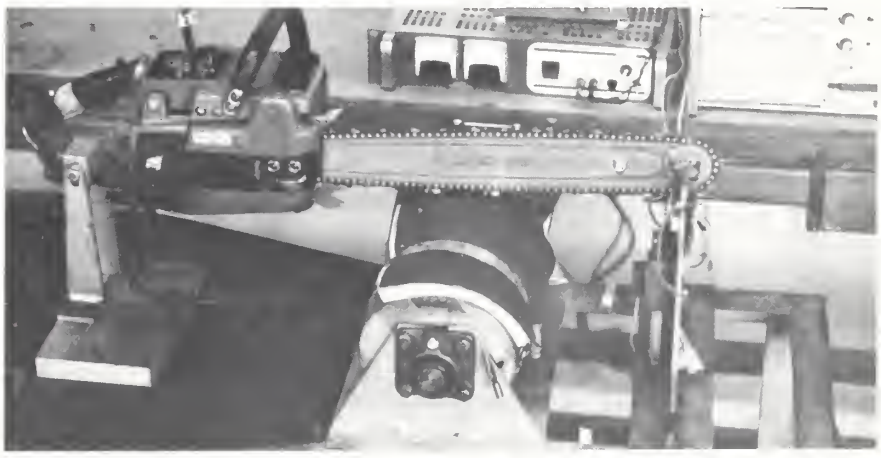

Fig. 1

The chaps are designed to stop a gasoline-powered saw chain before the cutters can penetrate to the leg. Kevlar's cut-resistant properties help to slow the chain, and the pad material is designed to be pulled by the cutters into the saw jamming the chain.

The new chaps weigh 2 pounds, 40 percent less than the existing model and provide 50 percent more protection for a price increase of $5. (fig. 2).

Prototype chaps evaluated in field tests were rated as very comfortable to wear and easy to adjust and use. The lighter, thinner chaps allowed more freedom of movement while staying in place better than the present chaps.

Fig. 2

The new chaps will be available from the General Services Administration (GSA) when its stock of existing chaps is depleted. ■

[1] Kevlar is an aramid fiber manufactured by the E.I. duPont de Nemours & Co. Kevlar fabrics are used in ballistic vests and cut-resistant gloves. Kevlar's strength, light weight, and flame resistance make it an ideal fiber for chain saw protective clothing.

U S DEPARTMENT OF AGRICULTURE
WASHINGTON, D C 20250

OFFICIAL BUSINESS

POSTAGE
& FEES PAID
U.S. DEPT.
OF
AGRICULTURE
AGR 101

The above represents the theme and basic poster for the 1982 Cooperative Forest Fire Prevention (CFFP) Campaign.

Each year over $1 million worth of materials are produced and distributed by the CFFP campaign in efforts to protect America's forest resources from the destruction of human-caused fires.

Under the direction of the National Association of State Foresters and the USDA Forest Service, The Advertising Council annually sends out mailings of special materials to about 800 television stations, 6,000 radio stations, 8,500 newspapers, 750 magazines, outdoor advertisers and transportation companies. It is estimated that the dollar value of media donation of time and space is over $55 million. Other campaign materials are shown on page 13 of this issue.

"REMEMBER . . . ONLY **YOU** CAN PREVENT FOREST FIRES" ■